



# STV8163

## +3.3 V, +5 V and Adjustable Triple-Voltage Regulator with Disable and Reset Functions

### FEATURES

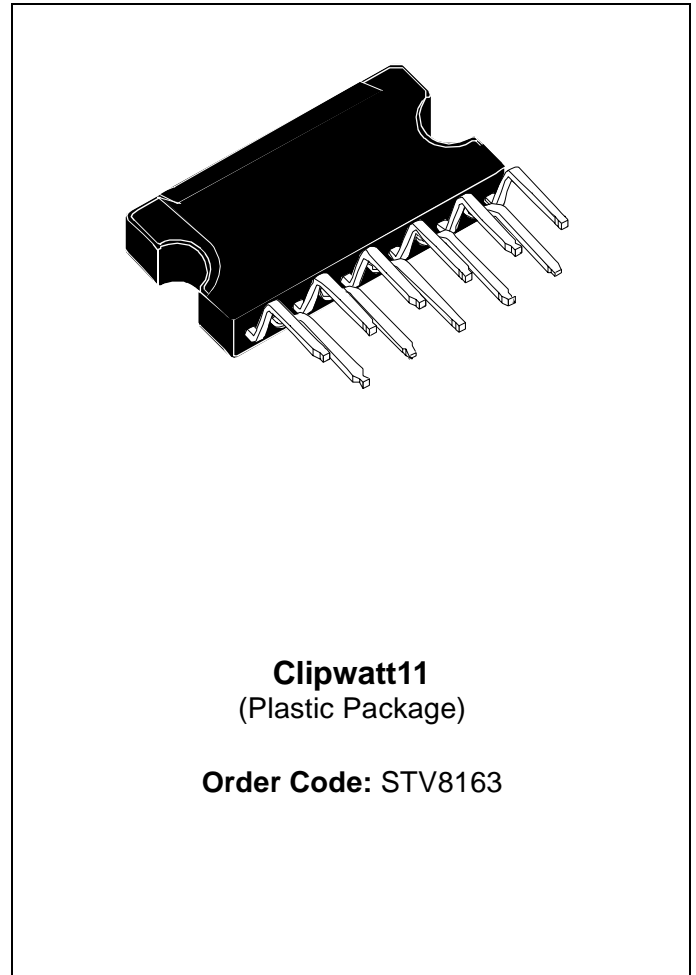
- Input Voltage range between 5V and 18V, limited to  $V_{OUT} + 6.5V$
- Maximum Available Output Currents greater than 0.8 A
- Fixed Precision Output 1 voltage of  $3.3 V \pm 2\%$  (at 10 mA)
- Fixed Precision Output 2 voltage of  $5 V \pm 2\%$  (at 10 mA)
- Programmable Output 3 voltage:  $2.5$  to  $16 V \pm 2\%$
- Output 1 with Reset facility
- Outputs 2 and 3 can be disabled by digital input
- Short Circuit Protection on each output
- Thermal Protection
- Low Dropout Voltages

### DESCRIPTION

The STV8163 is a monolithic triple positive voltage regulator designed to provide fixed precision output voltages of 3.3 V, 5 V and an adjustable voltage for currents up to 0.6 A.

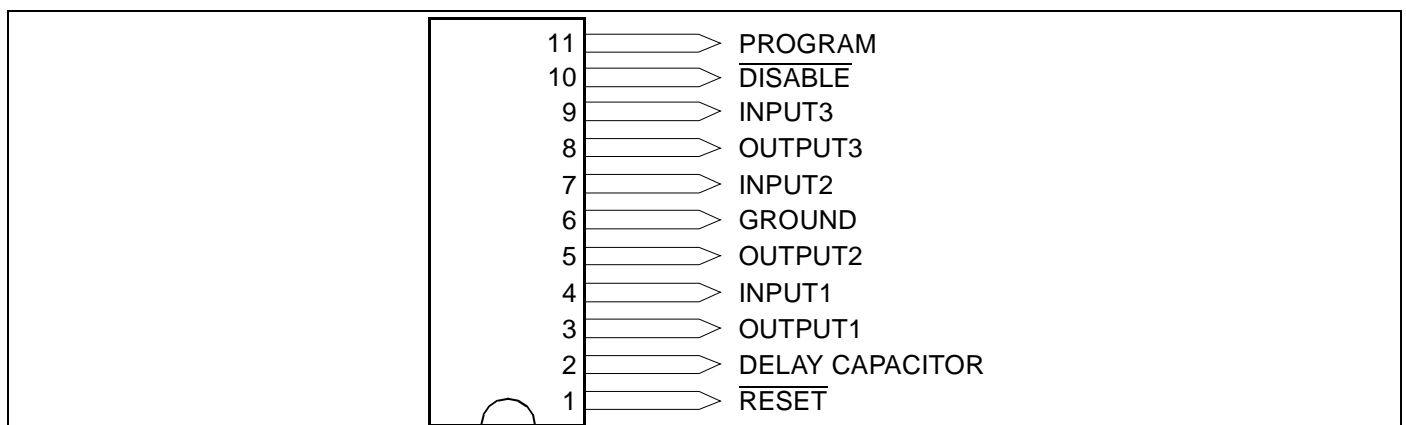
The adjustable value of the third output can be fixed from 2.5 V to 16 V.

An internal reset circuit generates a reset pulse when the voltage of Output 1 drops below the regulated voltage value.



Outputs 2 and 3 can be disabled by a digital input.

Short-circuit and thermal protections are included in all versions.



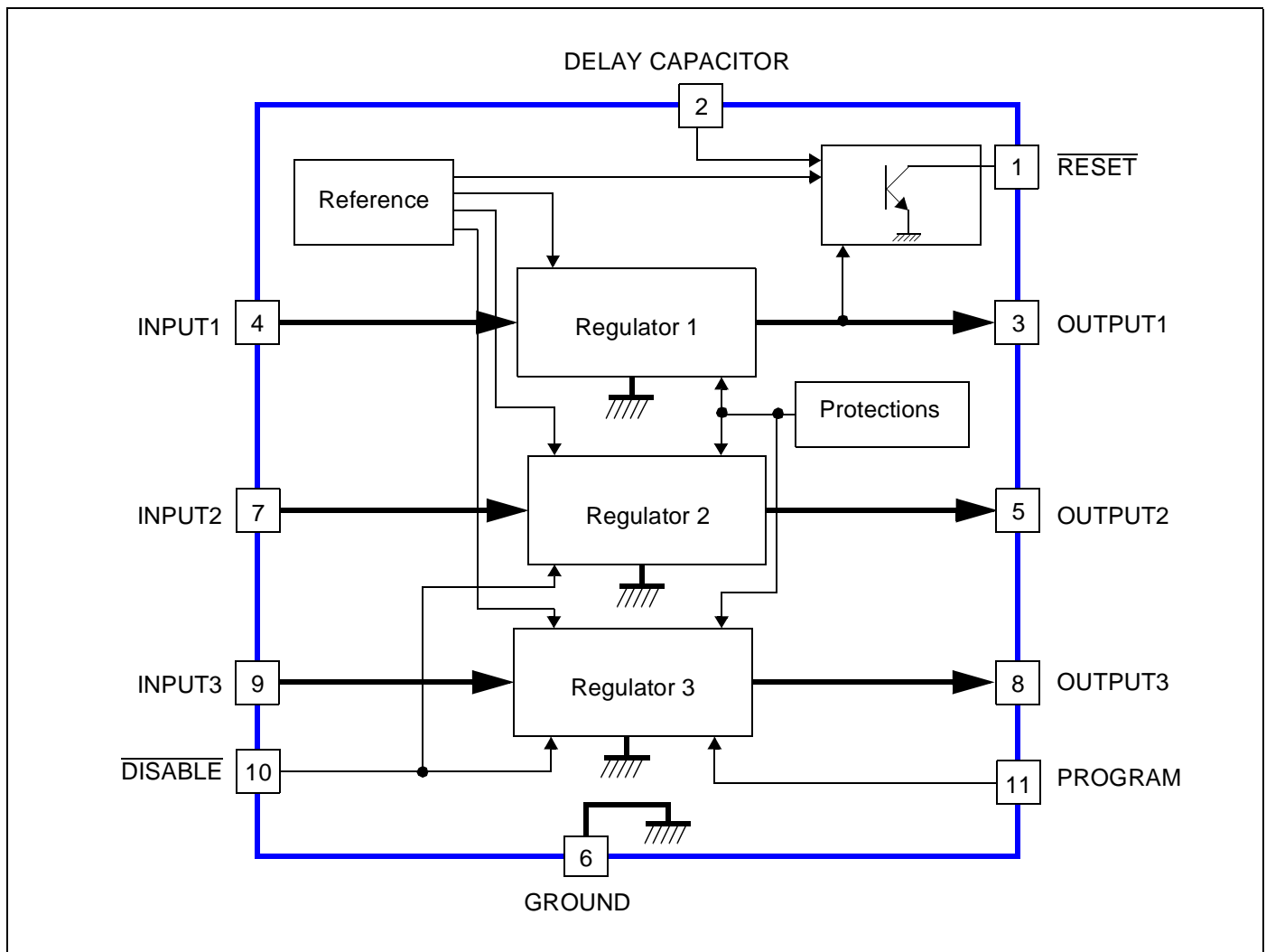
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# 1 GENERAL INFORMATION

Figure 1: STV8163 Block Diagram



## 2 ELECTRICAL CHARACTERISTICS

### 2.1 Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
$V_{IN}$	DC Input Voltage at pins INPUT1, INPUT2 and INPUT3	20	V
$V_{DIS}$	Disable Input Voltage at pin $\overline{DISABLE}$	20	V
$V_{RST}$	Output Voltage at pin $\overline{RESET}$	20	V
$I_{OUTPUT}$	Output Currents	Internally Limited	
$P_t$	Power Dissipation	Internally Limited	
$T_{STG}$	Storage Temperature	-65 to +150	°C
$T_J$	Junction Temperature	0 to +150	°C

### 2.2 Thermal Data

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal Resistance (Junction-to-Case)	3	°C/W
$R_{thJA}$	Thermal Resistance (Junction-to-Ambient)	$\geq 10^1$	°C/W
$T_J$	Maximum Recommended Junction Temperature	140	°C
$T_{OPER}$	Operating Free Air Temperature Range	0 to +70	°C

1. Depending on heat sink conditions.

### 2.3 Electrical Characteristics

$T_{AMB} = 25^\circ \text{C}$ ,  $V_{IN1} = 5.3 \text{ V}$ ,  $V_{IN2} = 7 \text{ V}$  and  $V_{IN3} = 10 \text{ V}$ , unless otherwise specified.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{OUT1}$	Output Voltage	$I_{OUT1} = 10 \text{ mA}$	3.24	3.30	3.36	V
$V_{OUT2}$	Output Voltage	$I_{OUT2} = 10 \text{ mA}$	4.90	5.00	5.10	V
$V_{OUT3}$	Output Voltage	$I_{OUT3} = 10 \text{ mA}$	2.5		16	V
$V_{OUT1}$	Output Voltage	$5.3 \text{ V} < V_{IN1} < 10 \text{ V}$ $5 \text{ mA} < I_{OUT1} < 600 \text{ mA}$	3.18		3.42	V
$V_{OUT2}$	Output Voltage	$7 \text{ V} < V_{IN2} < 12 \text{ V}$ $5 \text{ mA} < I_{OUT2} < 600 \text{ mA}$	4.80		5.20	V
$V_{IO1}$	Dropout Voltage	$I_{OUT1} = 0.6 \text{ A}$		1	1.4	V
$V_{IO2}$	Dropout Voltage	$I_{OUT2} = 0.6 \text{ A}$		1	1.4	V
$V_{IO3}$	Dropout Voltage	$I_{OUT3} = 0.6 \text{ A}$		1	1.4	V

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{OUT1LI}$	Line Regulation	$5.3\text{ V} < V_{IN1} < 10\text{ V}$ , $I_{OUT1} = 200\text{ mA}$			30	mV
$V_{OUT2LI}$	Line Regulation	$7\text{ V} < V_{IN2} < 12\text{ V}$ , $I_{OUT2} = 200\text{ mA}$			50	mV
$V_{OUT3LI}$	Line Regulation	$10\text{ V} < V_{IN3} < 15\text{ V}$ , $I_{OUT3} = 200\text{ mA}$ , $V_{OUT3} = 8\text{ V}$			80	mV
$V_{OUT1LO}$	Load Regulation	$5\text{ mA} < I_{OUT1} < 600\text{ mA}$			100	mV
$V_{OUT2LO}$	Load Regulation	$5\text{ mA} < I_{OUT2} < 600\text{ mA}$			100	mV
$V_{OUT3LO}$	Load Regulation	$5\text{ mA} < I_{OUT3} < 600\text{ mA}$ , $V_{OUT3} = 8\text{ V}$			160	mV
$I_Q$	Quiescent Current	$I_{OUT1} = 10\text{ mA}$ Outputs 2 and 3 disabled		2.2	3.0	mA
$V_{O1RST}$	Reset Threshold Voltage <sup>1</sup>	$K = V_{OUT1}$ , $I_{OUT1} > 50\text{ mA}$	K-0.4	K-0.25	K-0.10	V
$V_{RTH}$	Reset Threshold Hysteresis	See circuit description.	30	75	120	mV
$t_{RD}$	Reset Pulse Delay	$C_E = 100\text{ nF}$ See circuit description.		25		ms
$V_{RL}$	Saturation Voltage in Reset Condition	$I_{\overline{RESET}} = 5\text{ mA}$			0.4	V
$I_{RH}$	Leakage Current in Normal Condition, at $\overline{RESET}$ pin	$V_{\overline{RESET}} = 10\text{ V}$			10	$\mu\text{A}$
$K_{OUT1}$ $K_{OUT2}$ $K_{OUT3}$	Output Voltage Thermal Drift	$T_J = 0\text{ to }125^\circ\text{C}$ $K_{OUT} = \frac{\Delta V_{OUT} \cdot 10^6}{\Delta T \cdot V_{OUT}}$		100		ppm/ $^\circ\text{C}$
$I_{OUT1SC}$	Short Circuit Output Current	$V_{IN1} = 5.3\text{ V}$	0.8	1.3	1.8	A
$I_{OUT2SC}$	Short Circuit Output Current	$V_{IN2} = 7\text{ V}$	0.8	1.3	1.8	A
$I_{OUT3SC}$	Short Circuit Output Current	$V_{IN3} = V_{OUT3} + 2\text{V}$	0.8	1.3	1.8	A
$V_{PROG}$	Input Voltage at PROGRAM pin			2		V
$I_{PROG}$	Input Current at PROGRAM pin				5	$\mu\text{A}$
$V_{DISH}$	Voltage High Level at $\overline{DISABLE}$ pin (Outputs 2 and 3 active)		2			V
$V_{DISL}$	Voltage Low Level at $\overline{DISABLE}$ pin (Outputs 2 and 3 disabled)				0.8	V
$I_{DIS}$	Bias Current at $\overline{DISABLE}$ pin	$0\text{ V} < V_{\overline{DISABLE}} < 5.3\text{ V}$	-100		2	$\mu\text{A}$
$T_{JSD}$	Junction Temperature for Thermal Shutdown			150		$^\circ\text{C}$
$T_{SDH}$	Thermal Shutdown Temperature Hysteresis			15		$^\circ\text{C}$

1. This reset signal is activated by a decrease of  $V_{OUT1}$  voltage which can be due to an overload of pin OUT1 or by a lack of Input Voltage ( $V_{IN1}$ ).

### 3 CIRCUIT DESCRIPTION

The STV8163 is a triple-voltage regulator with Reset and Disable functions.

The three regulation parts are supplied from a single voltage reference circuit trimmed by zener zapping during EWS testing. Since the supply voltage of this voltage reference is connected to pin INPUT1 ( $V_{IN1}$ ), the second and third regulators will not work if pin INPUT1 is not supplied.

The output stages are designed using a Darlington configuration with a typical dropout voltage of 1.0 V.

The adjustable voltage of pin OUTPUT3 is defined by output bridge resistors (R1 and R2). The values of these resistors are calculated to obtain, with the targeted value for pin OUTPUT3, the VPROG voltage (2.0 V) on the median point connected to pin PROGRAM.

**IMPORTANT:** *In all applications, all three inputs must be polarized. If Outputs 2 or 3 are not used, the corresponding inputs must be connected to Input 1.*

The Disable circuit will switch off pins OUTPUT2 and OUTPUT3 if a voltage less than 0.8 V is applied to pin  $\overline{\text{DISABLE}}$ .

The Reset circuit checks the voltage at pin OUTPUT1. If this voltage drops below  $V_{OUT1}-0.25$  V (3.05 V Typ.), the "a" comparator (Figure 2) rapidly discharges the external capacitor ( $C_e$ ) and the reset output immediately switches to low. When the voltage at pin OUTPUT1 exceeds  $V_{OUT1}-0.175$  V (3.125 V Typ.), the  $V_{C_e}$  voltage increases linearly to the reference voltage ( $V_{REF} = 2.5$  V) corresponding to a Reset Pulse Delay ( $t_{RD}$ ) as shown in Figure 3.

$$t_{RD} = \frac{C_e \times 2.5V}{10\mu A}$$

Afterwards, the reset output returns to high. To avoid glitches in the reset output, the second comparator "b" has a large hysteresis (1.9 V).

#### 3.1 Currents versus Maximum Power Limitation

The currents provided by the three outputs can reach 1.6 A. However, the power dissipation in the STV8163 must be established so as not to activate the automatic thermal shutdown ( $T_J = 150^\circ$  C). It is recommended not to have all three currents at their maximum value simultaneously.

For example, if  $T_{AMB(MAX.)} = 70^\circ$  C, the maximum power dissipation in the STV8163 will be (with  $R_{thJA} = 12^\circ$  C/W):

$$\frac{140^\circ\text{C}-70^\circ\text{C}}{12^\circ\text{C/W}} = 5.8\text{W}$$

This means that the following conditions apply to input voltages and currents:

$$(V_{IN1} - 3.3\text{ V}) \times I_{IO1} + (V_{IN2} - 5\text{ V}) \times I_{IO2} + (V_{IN3} - V_{OUT3}) \times I_{IO3} < 5.8\text{ W}$$

Figure 2: Reset Diagram

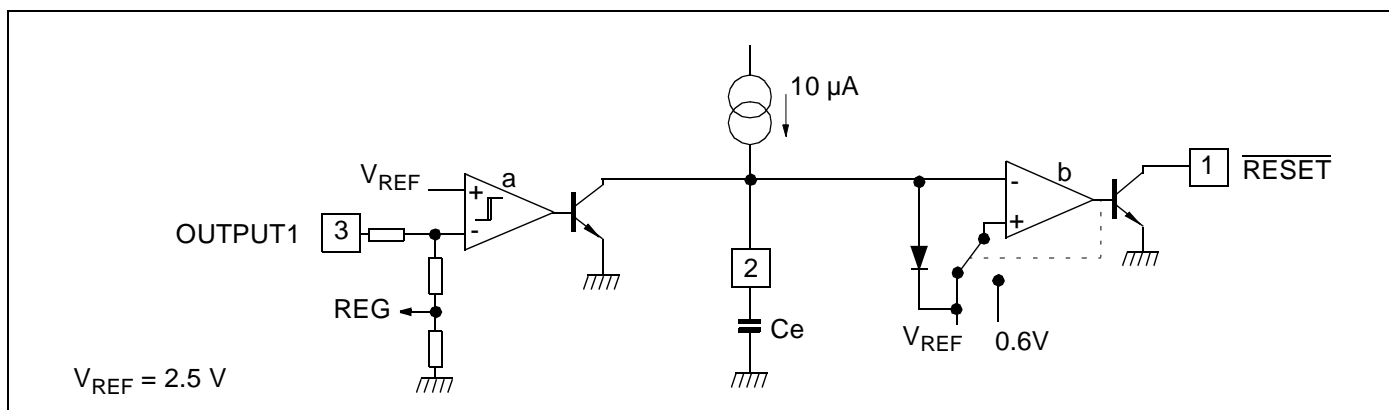
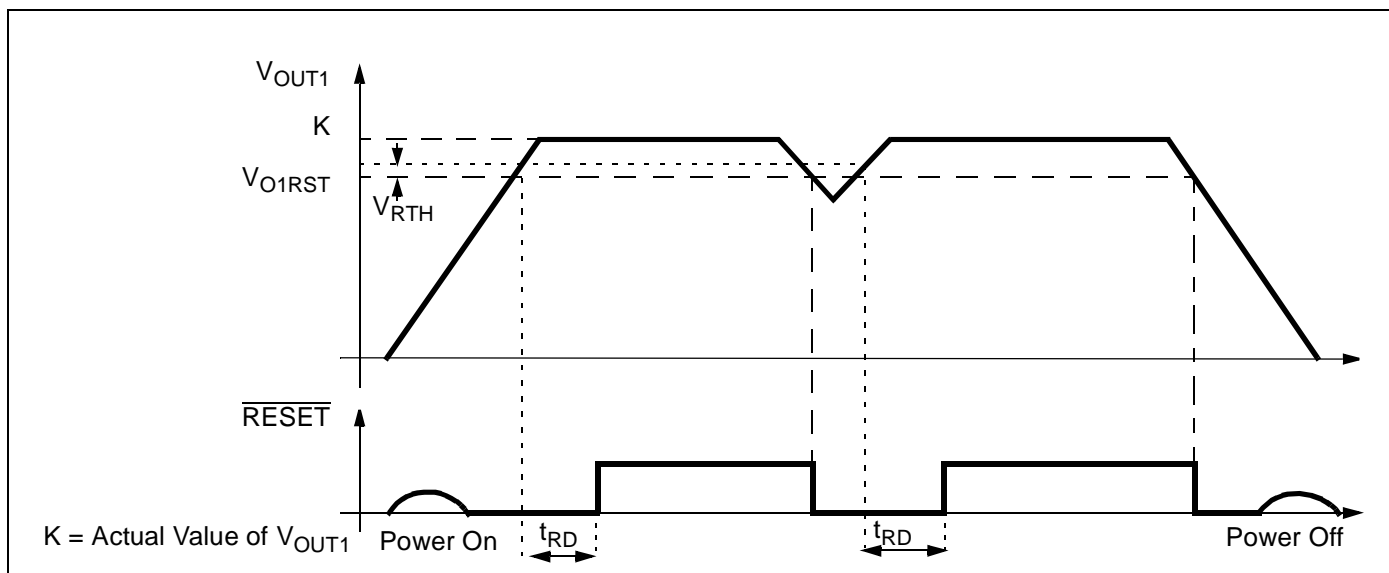
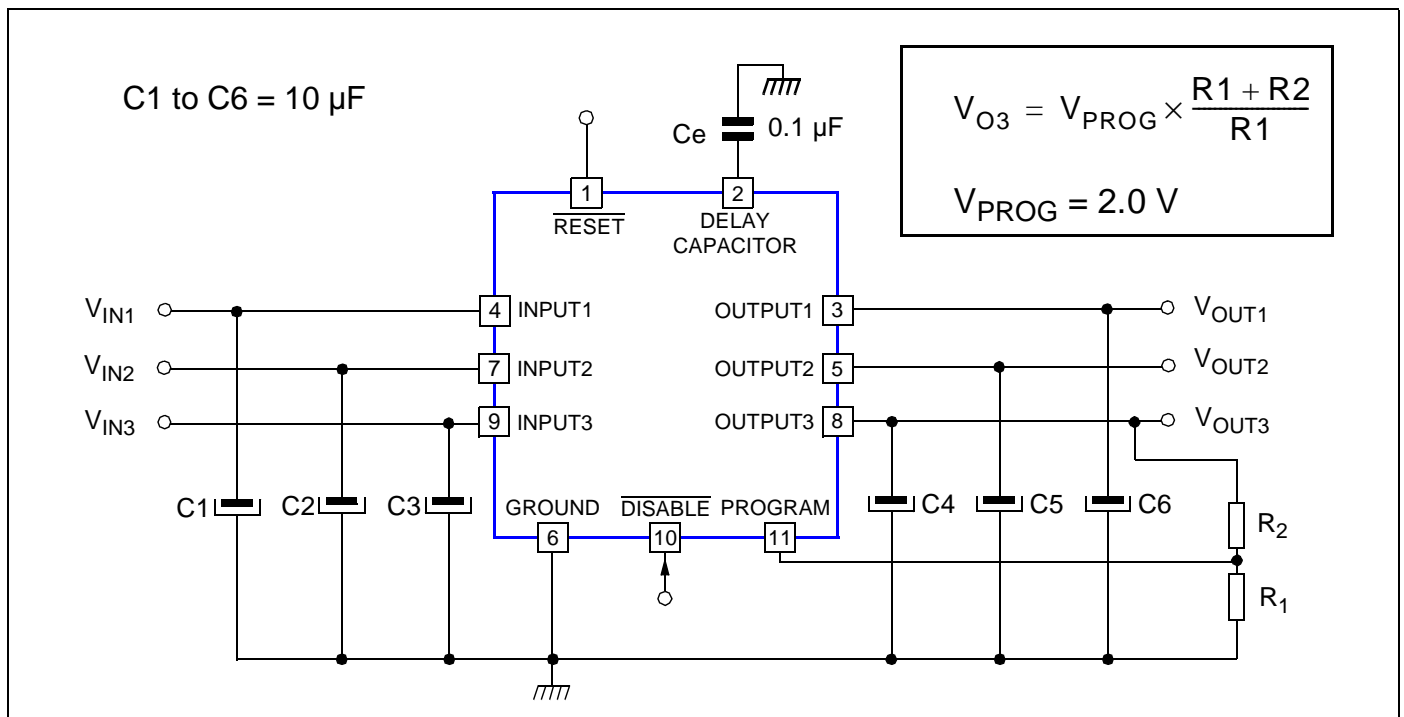


Figure 3: Internal Reset Voltage



## 4 APPLICATION DIAGRAM

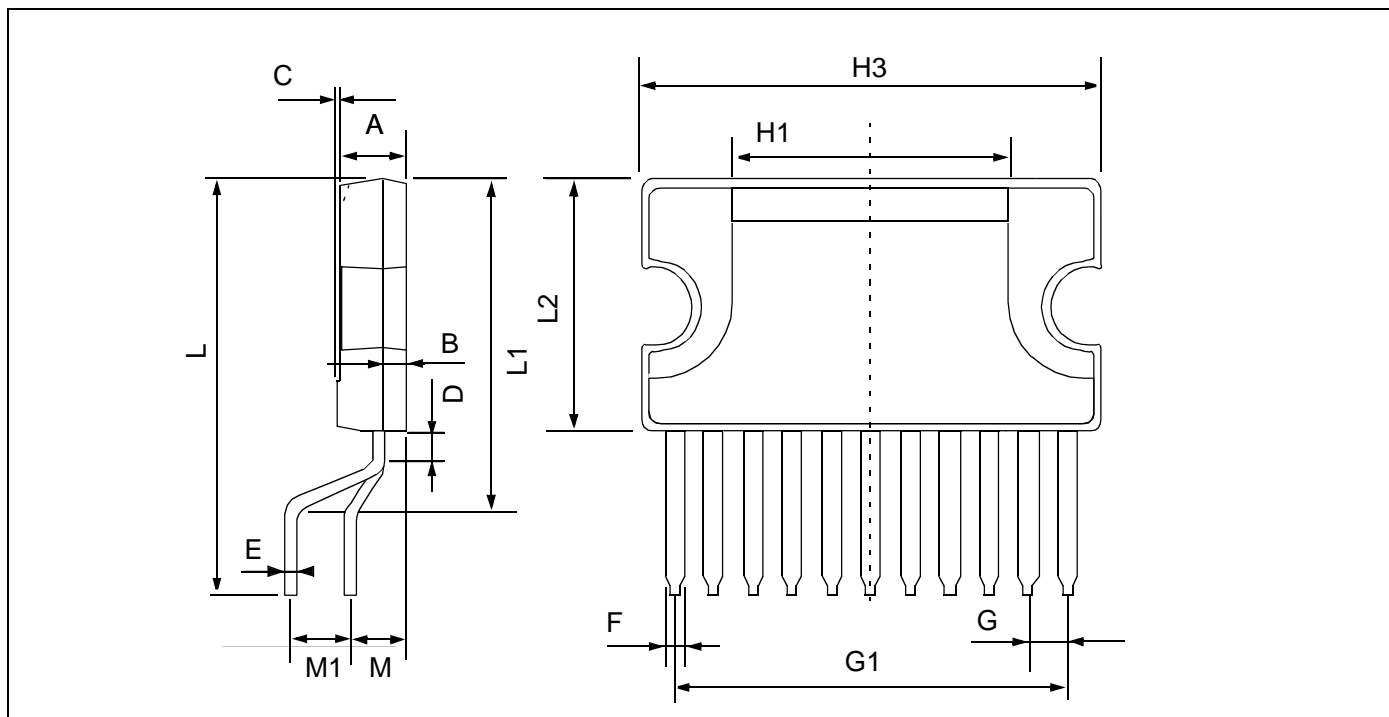
Figure 4: STV8163 Typical Application





## 5 PACKAGE MECHANICAL DATA

Figure 5: 11-Pin Plastic Clipwatt Package



Dim.	mm			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			3.20			0.126
B			1.05			0.041
C		0.15			0.006	
D		1.50			0.059	
E	0.49	0.55		0.019	0.002	
F	0.80		0.91	0.031		0.036
G	1.57	1.70	1.83	0.062	0.067	0.072
H1		12.00			0.480	
H2		18.60			0.732	
H3	19.85			0.781		
L		17.90			0.700	
L1		14.45			0.569	
L2	10.70	11.00	11.20	0.421	0.433	0.441
L3		5.50			0.217	
M		2.54			0.100	
M1		2.54			0.100	
	<b>Number of Pins</b>					
N	11					

## 6 REVISION HISTORY

Revision	Main Changes	Date
1.2	New Edition	June 2000
1.3	New edition. Pin name changed from DISABLE to $\overline{\text{DISABLE}}$ . Reset Threshold values updated. Update of Quiescent Current value in <a href="#">Chapter 2.3: Electrical Characteristics on page 4</a> .	8 January 2002
1.4	Update of reset voltage characteristics. Update of $I_Q$ , $I_{DIS}$ and $V_{O1RST}$ values in <a href="#">Chapter 2.3: Electrical Characteristics on page 4</a> .	31 January 2002
1.5	Document level changes from Preliminary Data to Datasheet. Modification of Short Circuit Output Current values in <a href="#">Section 2.3: Electrical Characteristics</a> .	21 May 2002
1.6	Output voltages and current further specified on Title page	12 June 2002

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